Vehicle monitor

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Monitoring of scrap

- Why?
  - The Mexican chair legs incident
  - The Taiwan RSJ problem
  - The Irish Steel + RTZ lead + zinc concentrate event
  - The Spanish Cs-137 plume
  - And many others

Reason

- All caused by the melting of an unexpected radioactive source in scrap metal
- So now all scrap melting plants have gate monitors and have forced all recyclers to monitor their scrap
- So we have to have them for metal and why not try to use them for other materials

Principle of operation 1

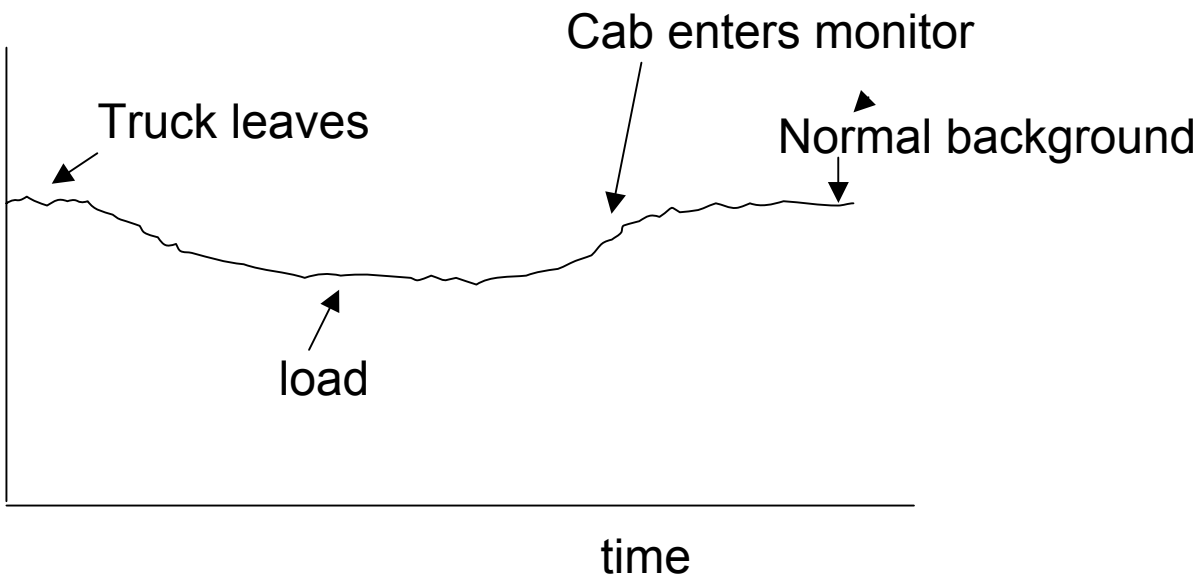
- One or two large plastic scintillator detectors either side of the truck.
- Each piece is between 30 and 60 kg
- Normal background is typically 5000 cps for the big pieces and 2500 cps for the smaller ones
- If you can lift it on your own, it’s too small!

Principle of operation 2

- Units measure background continuously
- Background can vary dramatically with a factor of 3 increase after rain - radon daughter washout
- Truck drives between the detectors
- For a clean truck loaded with steel, count rate falls as it's absorbing natural gamma radiation

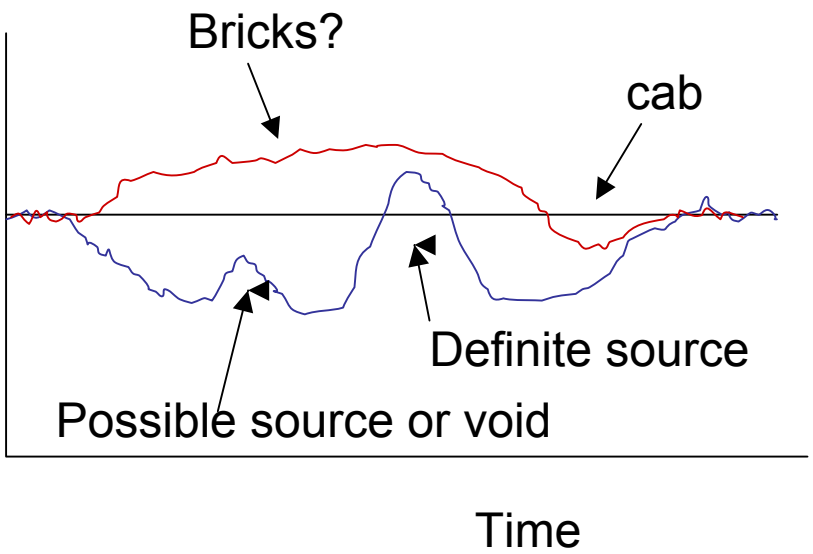
Principle of operation 3

- Count rate profile of a load of steel



Principle of operation 4

- Loads with a definite source, a void or possible source and an active material



The clever bit

- The clever bit is how the units interpret the time/count rate shape.
- A balance between false positives and false negatives
- The more “supervised” the unit is and the more skilled the workforce the higher the number of false positives are acceptable

Performance for point sources

- Difficult to predict
- Reasonably active, unshielded, hard gamma sources close to one edge of the box but in the middle of the length are easiest
- 10 kBq Co-60 on a good day
- In the middle of a dense load, shielded GBq sources could escape

Bulk activity

- Anything more active than the local soil should be detected.
- For 100% gamma emitters, about 0.1 Bq/g should be detectable

Important details

- Small masses of activated or bulk contaminated material are difficult to check by hand
- They can seem clean but still produce an alarm
- Remember the vehicle monitor only sees the gammas. Will it still work well enough for the fingerprint?
- Always a balance between false positives and false negatives